



Are Vehicle Travel Reduction Targets Justified?

Evaluating Mobility Management Policy Objectives Such As Targets To Reduce VMT And Increase Use Of Alternative Modes

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Bus priority can reduce total vehicle travel in ways that benefit everybody, including transit users who enjoy better service and motorists who experience less congestion, crash risk and pollution.

Abstract

This report investigates whether transportation policies should include targets to reduce vehicle travel and encourage use of alternative modes, called *mobility management objectives*. Such objectives are justified on several grounds: they help insure that individual short-term decisions support strategic goals, they provide numerous benefits, and they help prepare for future travel demands. Many mobility management strategies are market and planning reforms that increase transport system efficiency and equity. Mobility management criticism tends to reflect an older, automobile-oriented transportation planning paradigm which considers a limited range of objectives, impacts and options. More comprehensive analysis tends to favor mobility management. Appropriate mobility management can reduce vehicle travel in ways that minimize costs and maximize benefits to consumers and society.

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Introduction

Should transportation policies include *mobility management objectives*,¹ such as targets to reduce *vehicle miles of travel* (VMT) and encourage use of alternative modes (walking, cycling, public transit, etc.)? For example, the proposed *Federal Surface Transportation Policy and Planning Act of 2009* includes goals to “reduce national per capita motor vehicle miles traveled on an annual basis” and “increase the total usage of public transportation, intercity passenger rail services, and non-motorized transportation on an annual basis” (Commerce Committee 2009). Proposed federal legislation would establish goals to reduce per capita vehicle travel by 16%; triple walking, biking, and public transportation usage; and increase the proportion of rail and intermodal freight transport by 20% (Holt, et al. 2009). California law requires regional governments to develop *smart growth* transport and land use plans that reduce VMT (CPDR 2008). The Washington State legislature set a goal to reduce statewide per capita VMT 25% below 1990 levels by 2035 (Winkelman, Bishins and Kooshian 2009). Yolo County (2009) has proposed maximum VMT thresholds to reduce traffic congestion and pollution emissions.

There are several possible justifications for such targets:

- To help solve numerous problems and provide numerous benefits.
- To force a shift from automobile-dependent to multi-modal transport planning. They encourage policy makers to correct existing policies and planning practices that favor automobile travel over alternative modes and mobility over other forms of accessibility. They support implementation of reforms justified on efficient and equitable grounds.
- To provide strategic guidance for individual policy and planning decisions. A fundamental principle of good planning is that individual short-term decisions support strategic long-term goals. VMT reduction targets can help integrate policies and planning practices, reducing conflicts and inefficiencies.
- To help create a more diverse and efficient transportation system that better responds to future travel demands.

Highway advocacy groups (HUA 2009), activist organizations (Poole 2009a; O’Toole 2009; Cox 2009), and some transport policy experts (Pisarski 2009a) oppose these objectives claiming that VMT reductions necessarily harm consumers and the economy, are cost inefficient and unfair. Poole (2009b) calls VMT reduction goals “A terrible idea” and challenges proponents to prove they are cost effective. I accept that challenge.

This report investigates these issues. It discusses justifications for VMT reduction targets and evaluates criticisms of these policies. It discusses how mobility management objectives can help create a transportation system that better responds to future needs.

¹ *Goals* are ultimate desired outcomes, such as health, wealth and happiness. *Objectives* are specific policies or actions that help achieve goals. *Mobility management objectives* are therefore specific actions that affect the amount and type of mobility that occurs in an area.

Accessibility Versus Mobility

To understand this issue it is useful to consider the distinction between *accessibility* (people's ability to reach desired goods, services and activities) and *mobility* (physical movement). Accessibility is the ultimate goal of most transportation activity, excepting the small portion of travel for which movement is an end in itself, such as jogging or cruising; even recreational travel usually has a destination such as a picnic site or resort.

Mobility affects accessibility: all else being equal faster and cheaper mobility improves accessibility. For example, increasing travel speeds by 30% approximately doubles the number of destinations accessible in a given time period. But other factors also affect accessibility, including land use patterns (the distribution of destinations), and the quality of mobility substitutes such as telecommunication and delivery services. Planning decisions often involve tradeoffs between different types of access. For example, money and road space devoted to automobile transport is unavailable for other modes such as sidewalks, bikepaths, bus lanes and transit stations; and land use patterns that maximize automobile accessibility are generally difficult to access by other modes (automobile access favors dispersed, urban fringe development with abundant parking, which is often difficult to reach by walking, cycling and public transit).

Many current planning practices tend to favor automobiles over other modes and mobility over other forms of accessibility (Litman 2006b). For example, a major portion of transportation funding is dedicated to highways and cannot be used to improve other modes even if more beneficial overall; most zoning codes require generous parking supply which subsidizes driving and disperses development; and transportation system quality is generally evaluated based on mobility-based indicators, such as average traffic speeds and roadway level-of-service, which tend to ignore impacts on other modes.

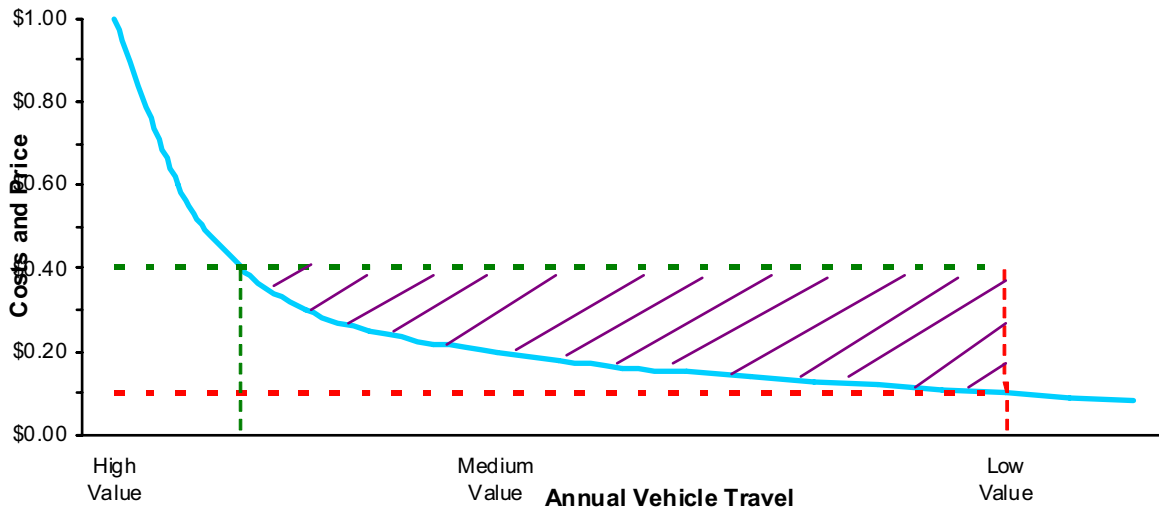
Planning practices favoring mobility over accessibility and automobile travel over other modes may have been justified during the early years of the Twentieth Century to take advantage of scale economies in roadway and vehicle production (your vehicle and roadway costs declined as your neighbors purchased more automobiles and drove more annual miles) once these systems matured such policies are no longer justified. Now, it is often more cost effective and beneficial overall to encourage more efficient use of existing roads and parking facilities than to expand them. For example, it may be cheaper overall to improve walking and cycling for local errands, and to improve public transit service quality for travel along congested urban corridors, than to try to expand roads and add more parking supply. VMT reduction targets are the first step in changing existing planning practices to help create more accessible, multi-modal communities.

Described differently, current high levels of per capita vehicle travel reflect transport system inefficiency which increases the amount of mobility needed to achieve a given level of accessibility. Mobility management can increase transport system efficiency, reducing the amount of vehicle travel, and transportation costs, required for people to meet their transportation needs.

Several specific factors can lead to economically excessive vehicle travel, and the portion of mobility with negative net benefits (total benefits are less than costs) for these reasons.

- Demand for mobility is potentially unlimited (Figure 1). If costs decline consumers can usually find reasons to increase their vehicle travel. For example, if supersonic travel was sufficiently subsidized many people would probably fly around the world for a dinner party, even if comparable services were available nearby, for novelty and prestige sake.
- Motor vehicle travel has high fixed and low variable costs, which encourages motorists to maximize their vehicle use so they can justify their vehicle expenditures. For example, a motorist who pays \$5,000 annually in depreciation, insurance, registration fees, and parking is unlikely to shift to alternative modes that save a few dollars per trip, since they are already spending nearly \$14 per day in fixed costs.
- Motor vehicle travel has significant external costs, including traffic congestion, road and parking subsidies, accident risk imposed on others, barrier effect (delays to nonmotorized travel), pollution, resource consumption externalities, and sprawl-related costs.
- For much of the last century, transportation and land use planning have favored mobility over accessibility and automobile travel over other modes. For much of this period, automobile-dependent, suburban development was considered normal and desirable, reducing consumer options. This stimulates per capita vehicle travel.
- Many of the demographic and economic trends that stimulated vehicle travel growth (rising employment rates, increased incomes, declining real fuel prices, highway expansion, suburban development, etc.) have peaked and are now declining. As a result, automobile-oriented policies and planning practices that may have been justified during the last century may be increasingly inappropriate for the next century.

Figure 1 **Mobility Demand Curve**



The demand curve (light blue line) for automobile travel has a “long tail” – as the price declines people find reasons to increase their annual mileage even if their marginal benefit is small. If automobile travel has a full cost of 40¢ (green dashed line) but much of this is external or fixed so motorists only perceive 10¢ per mile (orange dashed line), consumers will drive more than is economically efficient. Purple hatched area indicates the area of inefficiency.

Mobility Management Defined

Mobility management (also called *transportation demand management* [TDM] and *vehicle miles of travel* [VMT] *reductions*) refers to policies and programs that change travel activity to achieve planning objectives and increase transport system efficiency (VTPI 2008). Table 2 lists common mobility management strategies.

Table 2 Mobility Management Strategies (VTPI 2008)

Improved Options	Incentives	Land Use Policies	Programs
Transit improvements	Congestion pricing	Smart growth	Commute trip reduction programs
Walking and cycling improvements	Distance-based fees	New urbanism	School and campus transport management
Rideshare programs	Parking cash out	Parking management	Freight transport management
Flextime	Parking pricing	Transit oriented development	TDM marketing
Telework	Pay-as-you-drive vehicle insurance	Car-free planning	
Carsharing	Fuel tax increases	Traffic calming	

This table lists various mobility management strategies.

Mobility management is more than individual solutions to individual problems, such as road pricing to reduce congestion or transit improvements to reduce pollution; it tends to be most effective if implemented as an integrated program based on economic efficiency and good planning principles. It is supported by professional organizations such as the Institute of Transportation Engineers (www.ite.org/planning/tdm.asp) and the Federal Highway Administration (<http://ops.fhwa.dot.gov/tdm>). Even roadway expansion advocates often support specific mobility management strategies such as efficient road and parking pricing (Staley and Moore 2008).

Mobility management reflects a paradigm shift (Litman and Burwell 2006). The old planning paradigm assumed that *transportation* means automobile travel; that any increase in mobility is beneficial and any constraint on mobility is harmful; and transport agencies' only responsibility is to build roads to accommodate vehicle traffic. The new paradigm assumes the goal of transportation is *accessibility*; there is an optimal level of vehicle travel beyond which additional mobility is overall harmful to consumers and society; and that transportation agencies have many options and responsibilities.

Table 2 Transport Planning Paradigm Shift

Factor	Old Paradigm	New Paradigm
Definition of transportation	Vehicle travel – mobility	Accessibility (peoples' ability to reach desired goods, services and activities)
Modes considered	Automobile and truck	All modes
Land use development	Low-density, automobile-dependent	Compact, mixed, multi-modal
Performance indicators	Vehicle traffic speeds, roadway Level-of-Service	Multi-modal Level-of-Service, overall accessibility
Favored improvements	Expanded road and parking capacity, increased traffic speeds	Multi-modal improvements, mobility management,

A paradigm shift is changing the way transportation problems are defined and solutions evaluated.

Typical Policy and Planning Changes

Many policy and planning decisions affect travel activity, that is, the amount and type of mobility people choose. Many current policies and planning practices (such as generous minimum parking requirements, low road and fuel prices, dedicated road funding with less money available for other modes, and restrictions on land use development and mix) tend to stimulate automobile travel and reduce the convenience of other modes (Litman 2006b). These policies reflect the assumptions that “transportation” means automobile travel, and that increased automobile travel is overall cost effective and desirable.

VMT reduction targets reflect different assumptions. They recognize that accessibility is the ultimate goal of most transportation; that various modes and land use changes can help improve accessibility; and that VMT can often be reduced in ways that are cost effective and beneficial to society overall. VMT reduction targets should result in the following changes:

- More emphasis on improving alternative modes (walking, cycling, ridesharing and public transportation), and implementing mobility management strategies such as road pricing and commute trip reduction programs, instead of road and parking facility expansion. New funding sources should be developed and existing funds become more flexible so money can be spent on the cost effective and beneficial accessibility options.
- Reduced and more flexible parking requirements, with more frequent implementation of parking management strategies such as sharing and pricing, including cash out and unbundling. For example, commuters who are offered a subsidized parking space would be able to choose instead its cash equivalent or transit subsidies, and parking would be rented separately from building space so occupants would only pay for the number of parking spaces they actually want.
- More justification for implementing pricing reforms such as congestion pricing, parking pricing, increased fuel tax, and distance-based insurance and registration fees.
- More incentive for individual facility developers and managers to implement mobility management programs. For example, campuses, schools and employers would have more support and encouragement to implement transportation management and parking management programs.
- Tax policy reforms to reduce current biases that favor automobile travel, such as generous vehicle depreciation and mileage deductions rates.
- More support for mobility management marketing programs that provide information and incentives for commuters to use efficient modes.
- More justification for integrated policies and planning practices. For example, there would be more support for communities to simultaneously improve walking and cycling facilities, improve ridesharing and transit services, encourage infill development, reduce parking requirements, and implement parking management strategies.
- More comprehensive analysis of planning decision impacts. For example, there should be more support for research on the full impacts of land use policies, investments, facility designs, parking requirements, and pricing strategies.

Analysis Scope

Disagreements about the merit of mobility management often reflect differences in analysis scope – the range of benefits and costs considered. Critics generally consider just one or two benefits while proponents consider additional benefits, including some traditionally ignored in transport project evaluation such as parking cost savings, improved mobility for non-drivers, and health impacts.

For example, Poole (2009a and 2009b) and Pisarski (2009a) argue that VMT reduction policies are cost ineffective, but they are only considering air pollution emission reductions. Most proponents would probably agree; if pollution reduction were the only benefit few mobility management strategies would be justified. However, when additional impacts are considered mobility management is often cost effective.

Mobility management critics tend to equity impacts. They assume that everybody (at least, everybody who matters) can use an automobile and so ignore the benefits of improving accessibility for non-drivers, and the disamenity that wider roads, increased traffic speeds and sprawled land use have on access by other modes.

Critics tend to assume that past trends which stimulated vehicle travel will continue into the future, which justifies maintaining current transportation policies and planning practices. They ignore current demographic and economic trends that are changing travel demands, including aging population, rising future fuel prices relative to incomes, vehicle ownership saturation, increased urbanization, increasing traffic congestion, rising roadway expansion costs, and increased health and environmental concerns, all of which tend to shift demand from automobile travel to other modes (Litman 2009b).

When comparing various emission reduction strategies mobility management critics often ignore *rebound effects*, the additional vehicle travel that results from increased vehicle fuel economy which reduces the cost of driving (UKERC 2007). For example, if fuel efficiency regulations or feebates induce motorists to increase their average fuel efficiency from 20 to 30 miles-per-gallon, per-mile fuel costs decline 33%, which typically increases annual mileage about 10% (assuming a long-term -0.3 elasticity of vehicle travel with respect to fuel price), increasing external costs such as traffic congestion, road and parking facility costs, accident risk imposed on other road users, and land use sprawl.² Ignoring rebound effects tends to exaggerate the value of strategies that increase vehicle fuel efficiency and therefore skew policy decisions away from mobility management strategies.

² Mobility management critics often argue that mobility is very inelastic, citing research Small and Van Dender (2007) which implies that even large price increases have little effect on vehicle travel. But that study was based on U.S. data from 1960 to 2000, a unique period of rising vehicle ownership, increasing employment rates, rising real incomes, declining real fuel prices, highway construction, declining transit service quality, and suburbanization. Many of these trends have peaked and are now reversing. Motorists are likely to be more price sensitive in the future due to retiring Baby Boomers, rising real fuel prices relative to incomes, and increased urbanization. Vehicle travel is likely to be even more price sensitive if transportation and land use policy reforms improve the accessibility options available to consumers.

Mobility Management Justifications

The following sections discuss specific justifications for mobility management and therefore for vehicle travel reduction policy objectives.

Provides Strategic Guidance for Individual Policy and Planning Decisions

A fundamental principle of good planning is that individual, short-term decisions should be consistent with strategic, long-term goals. Current transportation policies often fail to reflect this principle: individual planning decisions often contradict strategic objectives, resulting in inefficiency. Mobility management objectives can help guide individual policy and planning decisions so they are more integrated. For example, mobility management objectives encourage policy makers to choose efficient pricing and investments, transportation agencies to develop mobility management programs, and transportation professionals to learn about mobility management techniques.

This guidance is not limited to special, mobility management programs such as commute trip reduction programs. It can apply to many day-to-day planning decisions that affect the amount and type of mobility that occurs in an area, as summarized in Table 3. Although decisions that stimulate mobility (such as low fuel prices and unpriced parking) may seem reasonable with modest individual impacts, their effects are cumulative and can be large in total: people who live or work in automobile-oriented areas typically drive 40-60% more annual miles and rely less on alternative modes than they would in more multi-modal communities (Pratt 1999-2009; Ewing, et al. 2007; VTPI 2008).

Table 3 **Examples of Policy and Planning Decisions That Affect Mobility**

Transport Policies	Land Use Policies
Fuel prices	Location of facilities and activities (jobs, housing, services, etc.)
Road tolls	Land use density and mix
Roadway supply and design	Parking supply and price
Sidewalk and path supply and quality	Building orientation
Public transit service supply and quality	
Mobility management programs	

Many policy and planning decisions affect the amount and type of mobility that occurs in an area.

These impacts are often overlooked. Many transport and land use policy decisions are based on narrow, short-term goals with little consideration of strategic, long-term goals. For example, transportation agencies often expand roadways to reduce traffic congestion, although this induces additional vehicle travel which increases downstream traffic and parking congestion, accidents, energy consumption and pollution emissions, although other congestion reduction strategies are available. Similarly, most local governments have generous minimum parking requirements to improve parking convenience, although this induces additional vehicle traffic and sprawl, which increases traffic congestion, accidents, energy consumption and pollution emissions. Mobility management objectives encourage decision makers to choose congestion reduction strategies that also help reduce parking problems, crashes and pollution emissions, and the parking solutions that also help reduce congestion and consumer costs, and improve mobility for non-drivers.

Helps Solve Numerous Problems and Provide Numerous Benefits

Most mobility management strategies can help solve numerous problems and provide numerous benefits, including congestion reduction, road and parking cost savings, consumer savings, traffic safety, improved mobility for non-drivers, energy conservation, emission reductions, efficient land development, and improved public fitness and health. Although not every strategy achieves all of these benefits, most help achieve several (Kendra et al. 2007). Some strategies reduce especially costly vehicle travel. For example, public transit improvements, efficient road and parking pricing, and commute trip reduction programs tend to reduce urban-peak vehicle travel, which has high congestion, parking, consumer and pollution costs, and freight transport management tends to reduce heavy truck travel that has high roadway costs and pollution emissions.

Most mobility management strategies only affect a small portion of total travel and so individually are seldom considered the best solution to a particular problem. However, their impacts are cumulative and synergistic (total impacts are larger than the sum of individual impacts) so integrated programs can provide large benefits and are often cost effective (Kendra et al. 2007; VTPI 2008). For example, public transit improvements may only reduce a few percent of total vehicle traffic, and so would not be considered the optimal solution to individual problems such as congestion, accidents, energy consumption or pollution, but a package of transit improvements, pricing reforms, and other supportive policies can provide much larger impacts and benefits.

Mobility management tends to be particularly beneficial compared with alternative solutions. For example, although roadway expansion may reduce traffic congestion, it tends to induce additional vehicle travel which exacerbates parking problems, accidents, energy consumption, pollution emissions and sprawl. Similarly, increasing vehicle fuel efficiency conserves energy but by reducing vehicle operating costs tends to increase total vehicle travel which exacerbates traffic and parking congestion and accidents. Mobility management strategies help achieve multiple objectives, as illustrated in Table 4.

Table 4 Comparing Strategies (VTPI 2008)

Planning Objective	Roadway Expansion	Fuel Efficient Vehicles	Mobility Management and Smart Growth
<i>Vehicle travel impacts</i>	<i>Increased</i>	<i>Increased</i>	<i>Reduced</i>
Congestion Reduction	✓	✗	✓
Parking Savings	✗	✗	✓
Facility Savings	✗	✗	✓
Consumer Savings	✗		✓
Reduced Traffic Accidents	✗	✗	✓
Improved Mobility Options	✗		✓
Energy Conservation	✗	✓	✓
Pollution Reduction	✗	✓	✓
Land Use Objectives	✗	✗	✓
Physical Fitness & Health	✗		✓

Some transport improvement strategies help achieve one or two objectives (✓), but by increasing total vehicle travel contradict others (✗). Win-Win strategies reduce total motor vehicle travel, and so support many planning objectives, providing multiple economic, social and environmental benefits.

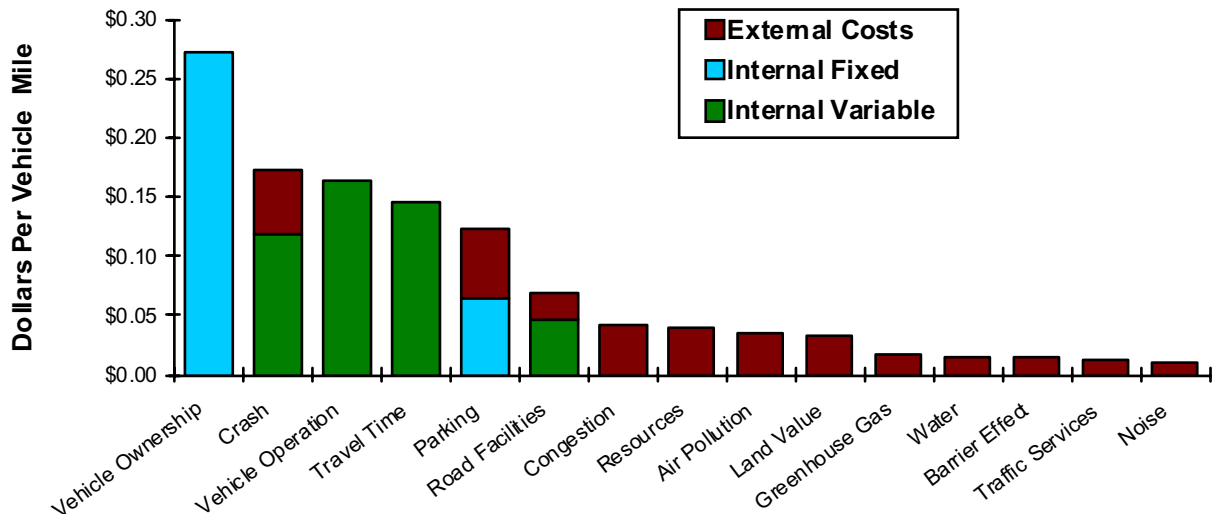
Table 5 **Automobile Transportation Cost Estimates (Litman 2008)**

Cost Category	Estimates	Monetization Methods
Vehicle Ownership	0.272	Published estimates of vehicle ownership costs (depreciation, insurance, etc.).
Crashes	0.173	Estimates of the full costs of traffic crash damages and injuries.
Vehicle Operation	0.164	Published estimates of vehicle operating costs (fuel, oil, tire wear, etc.).
Travel Time	0.146	Published estimates of the value people place on their travel time.
Parking	0.124	Estimates of total parking costs to consumers, businesses and governments.
Road Facilities	0.069	Transportation agency expenditures on road construction and maintenance.
Congestion	0.042	Published estimates of congestion traffic congestion costs.
Resources	0.039	Estimated external economic costs of consuming resources such as gasoline.
Air Pollution	0.035	Published estimates of local air pollution costs.
Land Value	0.034	Published estimates of the value of land used for roadways.
Greenhouse Gas	0.017	Published estimates of climate change emission costs.
Water Pollution	0.014	Estimated water pollution and hydrologic cost of vehicle use and roadways.
Barrier Effect	0.014	Estimated delay cost to pedestrians and cyclists caused by vehicle traffic.
Traffic Services	0.012	Government expenditures on traffic planning, policing and emergency services.
Noise	0.011	Published estimates of noise pollution costs.

This table indicates the estimated value of various vehicle costs and therefore VMT reductions benefits.

These benefits can be quantified. Table 5 and Figure 2 indicate estimated average *monetized* (measured in monetary units) costs of automobile transportation, and therefore the value of vehicle travel reduction benefits. For example, a mobility management strategy that reduces a million VMT is estimated to provide \$173,000 worth of crash cost savings, \$42,000 worth of congestion reductions, and \$35,000 worth of air pollution reductions. Such benefits are greater if VMT reductions consist primarily of urban-peak travel, which has higher than average costs. This illustrates the importance of comprehensive analysis. For example, a strategy that reduces congestion by 20% is worth much less if it also increases vehicle costs, crashes or parking costs by 10%, because those costs are relatively large in magnitude, but a congestion reduction strategy becomes much more cost effective if it also reduces vehicle, crash or parking costs.

Figure 2 **Costs Ranked by Magnitude (Litman 2008)**



This figure shows Average Car costs per vehicle mile, ranked by magnitude.

Helps Prepare For Future Travel Demands

Several demographic and economic trends reduce demand for automobile travel and increase demand for alternative modes.

Trends Shifting Travel Demands (Litman 2006a; Litman 2009b)

- *Aging population.* As the Baby Boom generation retires per capita vehicle travel will decline and their demand for alternatives will increase.
- *Saturation of vehicle ownership and use.* During most of the last century, per capita vehicle ownership and use rose steadily, but in the last decade they have reached saturation levels, so no further growth is expected.
- *Rising fuel prices.* This will increase demand for energy efficient travel options such as walking, cycling and public transit, and more accessible land use development.
- *Increasing urbanization.* As more people move into cities the demand for urban modes (walking, cycling and public transportation) increases.
- *Increasing traffic congestion and roadway construction costs.* This increases the relative value of alternative modes that reduce urban traffic congestion.
- *Shifting consumer preferences.* Various indicators suggest that an increasing portion of consumers prefer multi-modal urban neighbourhoods and alternative modes.
- *Increasing health and environmental concerns.* Many individuals, organizations and jurisdictions plan to reduce pollution and increase physical fitness.

As a result of these trends, per capita annual automobile travel has peaked in most wealthy countries, and demand for alternatives is growing.³ This is not to suggest that automobile travel will disappear, but per capita vehicle travel is likely to decline somewhat in future, and demand for alternative modes is likely to increase. It is sensible for transportation policies to reflect these changes, which means creating more diverse and efficient transportation systems, and more accessible, multi-modal communities. Mobility management objectives are a practical way to help implement these changes.

³ In public lectures I often ask the audience, “Compared with your current travel patterns, how many of you would prefer to drive more than you currently do, and how many would prefer to drive less, provided that alternative modes are convenient, comfortable and affordable?” In virtually every case most audience members indicate that they would prefer to drive less and few want to drive more than they currently do.

Corrects Existing Policies that Resulted in Economically Excessive Vehicle Travel

According to economic theory, an efficient transport system must reflect these principles:

- *Consumer options.* Consumers have a variety of transport and location options so they can choose the combination that best meets their needs and preferences.
- *Efficient pricing.* The prices that consumers pay for a good reflect the full marginal costs of supplying that good, unless a subsidy is specifically justified.
- *Economic neutrality.* Public policies and planning practices are not arbitrarily biased in favor of one good over others.

Current transportation policies are distorted in various ways that tend to increase motor vehicle travel beyond what is economically optimal, as summarized in Table 6.

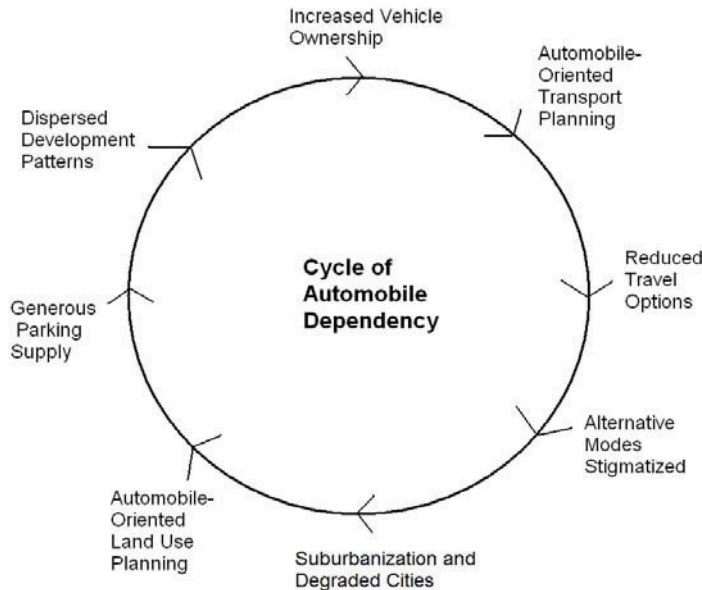
Table 6 Summary of Transportation Market Distortions

	Description	Examples	Potential Reforms
Consumer options and information	Markets often offer limited alternatives to automobile transportation and automobile-oriented location.	Poor walking and cycling conditions. Inadequate public transit service. Lack of housing in accessible, multi-modal locations.	Improve alternative modes such as walking, cycling, public transit and carsharing. Integrate alternative modes. Make more affordable housing available in accessible areas.
Efficient Pricing	Many motor vehicle costs are fixed or external.	Unpriced roads. Unpriced parking. Fixed insurance and registration fees. Low fuel prices.	As much as feasible, charge marginal prices for roads, parking and emissions, and convert fixed costs, such as insurance and registration fees, into variable costs.
Transport Planning Practices	Transportation planning and investment practices favor automobile-oriented improvements, even when other solutions are more cost effective.	Dedicated roadway funds. Transportation system performance indicators based on vehicle traffic conditions. “Reductionist” planning, which ignores many objectives and options.	Apply least-cost planning. Fund alternative modes and mobility management whenever cost effective. Apply multi-modal transport performance indicators.
Land Use Policies	Current land use planning policies encourage lower-density, automobile-oriented development.	Generous minimum parking requirements. Restrictions on land use density and mix. Development and utility fees that fail to reflect the higher costs of dispersed locations.	Smart growth policy reforms that support more accessible, multi-modal land use development. Location-based development and utility fees.

This table summarizes various transportation market distortions and potential reforms.

For most of the last century, transportation and land use policies and planning practices tended to favored automobile travel. Transportation agencies used “predict and provide” planning: they expanded roads and required more parking in anticipation of traffic growth, and invested relatively little in other modes. This resulted in communities where driving is convenient but other modes are inconvenient and uncomfortable, creating a self-reinforcing cycle of increased automobile dependency and sprawl (Figure 3). Mobility management objectives can lead to more balanced and efficient transport systems.

Figure 3 Cycle of Automobile Dependency and Sprawl



This figure illustrates the self-reinforcing cycle of increased automobile dependency and sprawl. Establishing objectives to reduce vehicle travel and increase use of alternative modes can help correct existing market distortions that lead to inadequate transport options, economically excessive automobile travel, and sprawled land use patterns.

These planning practices reflect an assumption that any increase in vehicle travel is desirable. For example, transportation system performance is evaluated based on vehicle travel speeds and roadway level-of-service ratings, most parking standards impose generous minimum requirements and public policies strive to minimize road, parking and fuel prices so driving is cheap. But like any good, too much mobility can be as harmful as too little.

As an analogy, food is essential for life, and eating is an enjoyable and sociable activity. However, this does not mean that more eating is necessarily better, that current diets are optimal, or that society should subsidize all food. At the margin (relative to current consumption) many people would benefit from eating less. Food subsidies may be justified for undernourished people, but since over-eating can be as unhealthy as under-eating it is both economically and medically harmful to subsidize all food for everybody or in other ways encourage people to increase eating.

Similarly, that mobility provides benefits does not mean that *more* vehicle travel is necessarily better, that current levels of mobility are optimal, or that motor vehicle use should be subsidized. Transportation policies should strive to achieve the *optimal* level of mobility that maximizes benefits to users and society.

In a more efficient transportation system, with better mobility options, more efficient pricing, and more neutral public policies, consumers would drive less, rely more on alternative modes, and be better off overall as a result (Litman 2008). For example, improving walking and cycling conditions, and better public transit services typically reduces automobile travel 10-20%; efficient pricing (charging users directly for road and parking costs, distance-based insurance and registration fees, and emission fees) typically reduces automobile travel 20-40%; and more accessible and multi-modal land use policies typically reduce automobile travel 5-15% (Pratt 1999-2009; VTPI 2008).

Mobility management critics might argue that VMT reductions should be an outcome of market reforms rather than planning objectives. “Let’s just implement efficient pricing and let consumers decide whether or not to reduce their mobility,” they could suggest. But planning often involves tradeoffs between mutually-exclusive options. For example, money spent on roads and parking facilities is unavailable to invest in alternative modes, expanding roadways to increase traffic volumes and speeds degrades walking and cycling conditions, and generous minimum parking requirements stimulate more driving and lower-density development patterns.

Mobility management consists of practical methods to achieve more optimal transportation patterns. To the degree that current automobile travel is excessive and inefficient, mobility management is the solution. Mobility management strategies correct specific market distortions that result in excessive automobile ownership and use, and help reduce specific problems such as traffic congestion, high consumer costs, accidents, energy dependency and pollution emissions.

Mobility management objectives encourage policy makers and planners to correct current practices that stimulate VMT growth (such as unpriced roads, generous and free vehicle parking, and dedicated roadway funding that cannot be used for alternative modes) and to favor alternative practices that will result in a more diverse and efficient transportation system. For example, they encourage state and regional transportation agencies to invest more in walking, cycling, ridesharing and public transit, and to consider implementing pricing reforms and mobility management strategies as an alternative to expanding roadways. Similarly, they encourage local governments to reform parking policies and implement more efficient parking management. Mobility management objectives encourage transportation agencies to choose the congestion reduction strategies that also help conserve energy, reduce pollution and improve mobility for non-drivers, and encourage environmental agencies to choose energy conservation and emission reduction strategies that also help reduce congestion and accidents, and save consumers money.

Mobility management objectives will not really require motorists to “give up their cars altogether” or harm lower-income people, as critics claim (HUA 2009). Properly implemented mobility management can provide significant net benefits, particularly to lower-income people who tend to gain the most from more affordable mobility options, financial rewards for using alternative modes, and more accessible, multi-modal communities. The next section examines these criticisms in more detail.

Evaluating Criticisms

This section evaluates specific criticisms of mobility management objectives.

Harms Consumers

Mobility management critics argue that, since consumers choose to travel by automobile and select automobile-dependent locations, they must benefit directly, so policies that reduce vehicle travel and sprawl must harm consumers (Pisarski 2009a and 2009b). This is not necessarily true: many mobility management strategies use positive incentives that directly benefit consumers by improving travel options or rewarding vehicle travel reductions, and real estate market research indicates that consumers increasingly prefer smart growth home locations (Litman 2009b).

Table 7 Mobility Management Strategy Impacts (VTPI 2008)

Positive Incentives	Negative Incentives	Mixed
Public transit improvements	Road tolls	Smart growth
Walking and cycling improvements	Parking pricing	New urbanism
Rideshare and carshare programs	Fuel tax increases	Parking management
Flextime and telework		Transit oriented development
Pay-As-You-Drive pricing		Car-free planning
Parking cash out and unbundling		Traffic calming

This table categorizes mobility management strategies according to their direct impacts on users.

Even consumers who face negative incentives, such as higher fees or traffic calming, often benefit overall. For example, people who drive less due to higher road tolls, parking fees or fuel prices may be better off overall if revenues are used in ways that benefit them, for example, to improve their travel options or reduce other taxes. Even people who continue to drive may benefit overall if this reduces their congestion or accident risk, or reduces their need to chauffeur non-driving family members and friends (Litman 2007b).

Although it would be inefficient to reduce vehicle travel arbitrarily, for example, by randomly forbidding vehicle trips or closing roads, efficient mobility management improves the convenience of higher value automobile trips (by reducing congestion when motorists are willing to pay directly for road and parking use) while giving consumers incentives to reduce low-value automobile travel, such as trips that provide little benefit or that can easily shift to alternative modes or destinations.

To the degree that mobility management objectives help create a transportation system that better responds to future travel demands, applies positive incentives and efficient pricing, resulting vehicle travel reductions can maximize consumer benefits and minimize consumer costs.

Harms the Economy

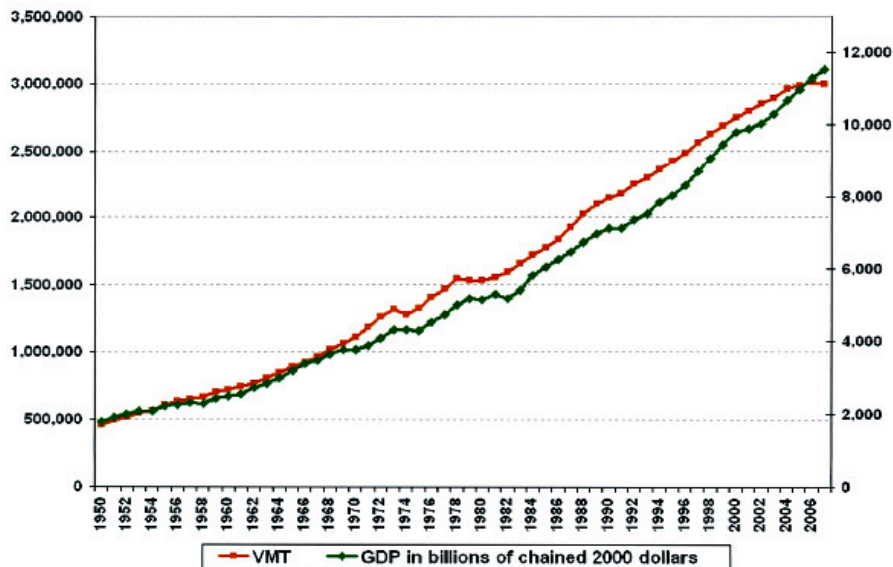
Critics sometimes argue that reducing vehicle travel is economically harmful. For example, the Highway Users Alliance claims the graph below proves that because vehicle travel and economic activity (measured as *gross domestic product* or *GDP*) are closely correlated, vehicle travel reductions are economically harmful. This proves nothing of the sort. This graph indicates nothing about the direction of the relationship or the feasibility of decoupling mobility and economic activity so that economic productivity can increase without vehicle travel growth.

Figure 4 US VMT and GDP Trends (HUA 2009)

Source: BEA & DOT data

Vehicle Miles Traveled (VMT) and Gross Domestic Product (GDP) are extremely closely correlated:

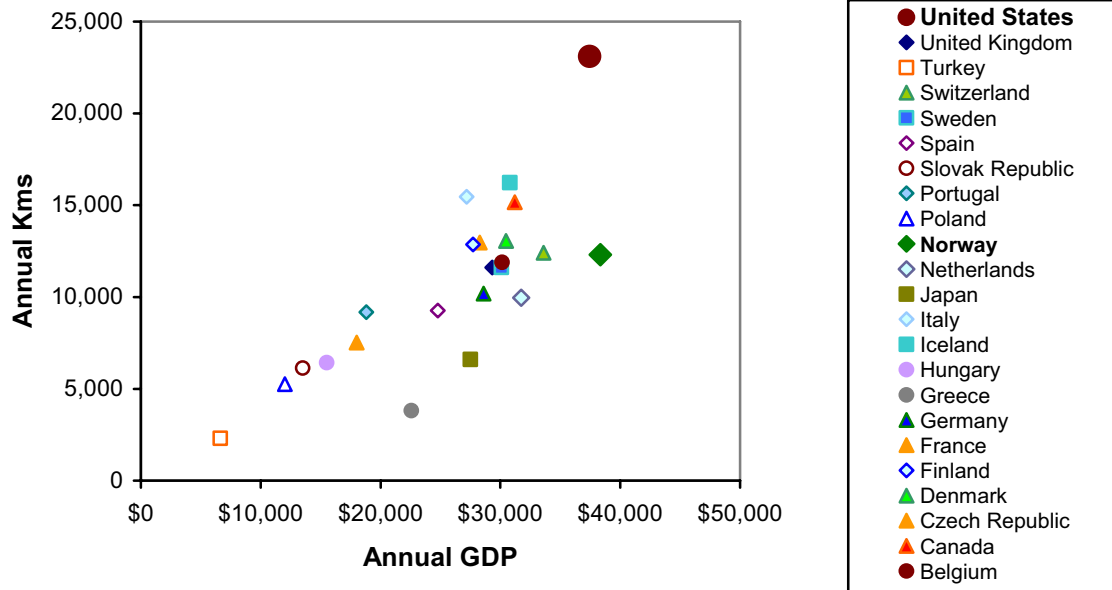
Since 1950, the cumulative correlation rate between VMT and Real GDP, calculated using Pearson's R, is 99.9%. This is an extraordinarily strong correlation even when calculating the R-square value of 98.9% which indicates the predictive value between the two variables (VMT or GDP).



The Highway Users Alliance claims that this graph proves that a reduction in vehicle travel will reduce economic productivity, but correlation does not prove causation.

The relationship between personal vehicle travel and economic development is weak (Baird 2005; O'Fallon 2003). Although personal mobility tends to increase as people shift from low to medium incomes, among high income countries per capita annual passenger-kilometers vary significantly depending on transportation and land use policies. Many wealthy countries have much lower levels of automobile travel than what occurs in the U.S., as illustrated in Figure 5. Of particular interest is Norway, which produces petroleum but maintains some of the world's highest fuel prices and has other mobility management policies that discourage automobile travel and encourage use of alternative modes. These policies minimized domestic fuel consumption, leaving more oil to export. As a result, Norway has one of the world's highest incomes, a competitive and expanding economy, a positive trade balance, and the world's largest legacy fund.

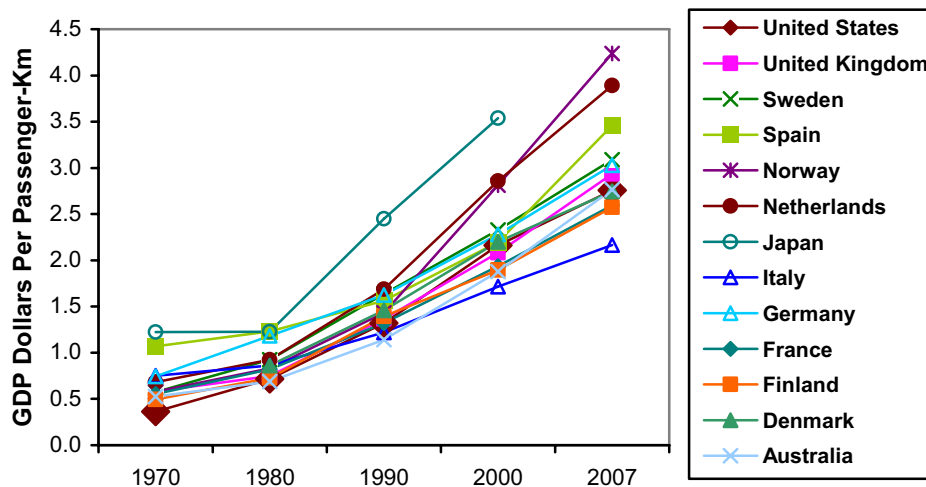
Figure 5 Per Capita Mobility and GDP, 2003 (OECD 2009)



Although personal mobility increases as countries shift from low- to middle-incomes, among high income countries per capita passenger-kilometers vary significantly, with about twice as much motorized travel in the U.S. than its peers due to differences in transport and land use policies.

Virtually all developed countries are increasing GDP per unit of mobility and some are more successful than the US, as illustrated in Figure 6. This efficiency increase (more economic output per unit of input), provides a competitive advantage. Mobility management is the practical way to achieve this efficiency gain; it allows consumers and businesses to increase economic productivity per unit of travel, reducing total transportation costs to consumers, businesses and governments.

Figure 6 GDP per Passenger-Kilometer for Various Countries (OECD 2009)



International data shows that all peer countries are increasing GDP per passenger-mile, some much more quickly than the U.S.

Ignores Mobility Benefits

Mobility management critics sometimes argue that mobility management proponents ignore mobility benefits, but this is generally untrue. As discussed earlier, the ultimate benefit of transportation is *accessibility*, mobility is seldom an end in itself. High levels of mobility may reflect transport system inefficiency: excessive physical travel is required to reach goods, services and activities, for example, due to dispersed land development patterns, barriers to walking and cycling, and inadequate mobility substitutes such as telecommunications and delivery services. Mobility management can benefit consumers by increasing system efficiency, so less physical travel is needed to achieve a given level of accessibility. This approach expands the range of solutions that can be applied to solving transport problems. For example, if transportation is defined only as mobility the only solution to traffic and parking congestion is to expand roads and parking facilities. Defining transportation based on accessibility allows a much broader range of solutions to be considered, including improvements to alternative modes and mobility substitutes, pricing incentives, and more accessible land use.

Most public officials and planners are quite aware of the value of accessibility and the role of mobility in meeting people's needs. However, they are aware that demand for mobility is potentially unlimited, so market-based approaches are needed to address problems such as congestion, so high value mobility can proceed without delay.

Economists have methods to quantify the value that consumers place on mobility, by testing consumers' willingness to pay for transportation facilities and services, and using the "rule of half" to measure changes in consumer surplus that result from changes in prices, as described in the box below.

Explanation of the "Rule of Half" (DfT 2003; Small 1999)

Economic theory suggests that when consumers change their travel in response to a financial incentive, the net consumer surplus averages half of their price change (called the "rule of half"). This takes into account total changes in financial costs, travel time, convenience and mobility as perceived by consumers.

Let's say that your vehicle operating costs increased by 10¢ per mile due to higher fuel prices, road tolls or parking fees, and you respond by reducing your annual vehicle use by 1,000 miles. You would not give up highly valuable vehicle travel, but there are probably some lower-value vehicle-miles that you would reduce by shifting modes or choosing closer destinations. The vehicle-miles foregone have an incremental value to you, the consumer, between 0¢ and 10¢. If you consider the additional mile worth less than 0¢ (it has no value) you would not have taken it in the first place. If its worth is between 1-9¢ per mile, a 10¢ per mile incentive will convince you to give it up – you would rather have the money. If the additional mile is worth more than 10¢ per mile, a 10¢ per mile increase is inadequate to convince you to give it up – you'll keep driving. Of the 1,000 miles foregone, we can assume that the average net benefit to consumers (called the *consumer surplus*) is the mid-point of this range, that is, 5¢ per vehicle mile. Thus, we can calculate that miles foregone by a 10¢ per mile financial incentive have an average consumer surplus value of 5¢. A \$100 increase in vehicle operating costs that reduces automobile travel by 1,000 miles imposes a *net cost* to consumers of \$50, while a \$100 financial reward that convinces motorists to drive 1,000 miles less provides a *net benefit* to consumers of \$50.

Pollution Reduction Cost Efficiency

Critics argue that mobility management is an inefficient way to reduce pollution emissions (Poole 2009b). This might be true if other impacts are ignored, but more comprehensive analysis often indicates that mobility management is often cost effective compared with alternatives when all benefits and costs are considered (Winkelman, Bishins and Kooshian 2009).

Described differently, a ton of emission reductions provided by mobility management provides many times the total benefits as the same amount of emissions reduced by more efficient and alternative fuel vehicles (e.g. hybrids and electric cars), because VMT reductions achieves other planning objectives, while increased vehicle fuel efficiency makes driving cheaper, which stimulates more vehicle traffic that exacerbates problems such as congestion, parking costs, accidents and sprawl (Litman 2005). Table 8 indicates mobility management benefits and costs. Critics generally consider only a few of these impacts and so underestimate total mobility management cost effectiveness.

Table 8 Mobility Management Benefits and Costs

Benefit Categories	Cost Categories
Direct user benefits (from positive incentives)	Reduced mobility benefits
Revenues (from pricing strategies)	Subsidies
Congestion reduction	User fees
Roadway costs savings	Transaction costs (costs to pay and collect fees, and any additional enforcement costs)
Parking cost savings	
Consumer savings	
Reduced chauffeuring burdens	
Accident reductions	
Improved mobility options	
Energy conservation	
Pollution reduction	
Physical fitness and health	

This table indicates the categories of benefits and costs that should be considered when evaluating mobility management cost effectiveness.

Some mobility management strategies are particularly cost effective. For example, fuel tax increases, distance-based insurance and registration fees, more efficient parking management, and land use policy reforms often have modest incremental costs and substantial economic benefits. Walking, cycling and public transit improvements are often cheaper than accommodating additional automobile travel, considering all costs (roads, parking and vehicle costs). Some strategies are particularly effective at reducing emissions. Fuel tax increases and distance-based pricing can provide significant emission reductions with modest implementation costs (CBO 2003; Parry 2005). Efficient road pricing reduces VMT and congestion, providing extra emission reductions. Aviation transport management reduces high altitude pollution emissions which have particularly severe climate change impacts. Freight transport management can reduce travel by heavy vehicles that have high emission rates per vehicle-mile.

No current study includes comprehensive analysis of mobility management benefits and costs. Some ignore mobility management altogether (Gallagher, et al. 2007) or mention it incidentally (McKinsey 2007). Some studies recognize mobility management as an important emission reduction approach (Burbank 2008; Yang, et al. 2008; Cambridge Systematics) but fail to quantify all benefits. As a result, most currently available studies undervalue mobility management and smart growth strategies. A recent Center for Clean Air Policy (CCAP) study identified the following examples of cost effective mobility management emission reduction programs (Winkelman, Bishins and Kooshian 2009):

- The Sacramento region's smart growth plan provides net economic benefits estimated at \$198 per ton of CO₂ emissions reduced due to infrastructure and consumer fuel savings.
- Transit investments and demand management in Georgia are projected to reduce emissions while providing more than \$400 billion net economic benefits over 30 years.
- The Atlantic Station project in Atlanta, Georgia will reduce CO₂ and provide net savings because additional municipal tax revenues exceed the project loan costs.
- Portland, Oregon's \$73 million downtown streetcar helped attract \$2.3 billion in private investment within two blocks of the line, and bicycle infrastructure spending is estimated to provide net economic benefits of more than \$1,000 per ton of CO₂ emissions reduced.
- Distance-based vehicle insurance could reduce vehicle travel and related emissions by 8%, provide direct consumer savings averaging \$270/vehicle-year and \$50-60 billion annual in total social benefits.

Crowding

Critics argue that smart growth land use policies impose crowding. This is generally untrue and reflects a misunderstanding of the concept. Although smart growth increases *density* (people per acre) it does not increase crowding (people per room or square foot of interior building space) if more compact development reduces building land requirements by reducing lot size and increasing the number of stories per building. For example, shifting from a 1,500 square foot single-story house on a 15,000 square foot lot to a 3,000 sf house on a 5,000 sf lot significantly increases density but reduces crowding.

Current and projected market trends favor smart growth (Litman 2009b). Demand for dispersed, automobile-dependent housing is declining while demand for housing in more accessible, multi-modal neighborhoods is growing due to factors such as aging population, rising fuel prices and shifting consumer preferences (Thomas 2009). There is still plenty of low-density, single-family, sprawled housing available for people who want it, since that has been the primary type of housing built during the last century and currently has high foreclosure rates and declining value (Leinberger 2008). On the other hand, there is latent demand for housing in accessible, multi-modal locations (Reconnecting America 2006).

Past development policies (such as generous minimum parking requirements and building setbacks, and excessive limits on development density and mix) caused sprawl; it makes sense to change these policies to encourage more urban infill and multi-modal development patterns (Levine 2006).

Consumer Sovereignty

Consumer sovereignty means that, as much as possible, consumers should be free to choose the goods that best meet their needs, without bias or coercion, to maximize their welfare. This principle suggests that transportation policies should allow consumers to choose how and how much to travel without external intervention. Critics argue that mobility management and smart growth policies constitute violates this principle. The Highway User Association claims that mobility management attempts to “alter behavior and personal choice” (HUA 2009), and Pisarski (2009a and 2009b) argues that such policies prevents consumers from choosing the lifestyles they prefer.

But current trends are shifting consumer preferences toward smart growth homes that support multi-modal lifestyles (Litman 2009b). As discussed earlier, many current policies and planning practices tend to favor automobile travel over other modes and more dispersed land use development, depriving consumers of options that involve alternative modes or more compact locations.

To the degree that current levels of automobile dependency and sprawl result from market distortions, mobility management and smart growth policies help achieve modal neutrality and consumer sovereignty. These policies tend to improve travel and housing options, allowing consumers to choose the combination that best meets their needs. They do not eliminate driving and single-family housing, even with programs that critics consider aggressive and “radical,” automobile travel would continue to have the largest mode share, Americans would continue to drive more than residents of peer countries, and most residents would live in single-family homes in most communities.

Harms Poor People

Critics claim that mobility management harms poor people. This might be true if the only strategy is to increase road, parking and fuel prices, but lower-income people can benefit significantly from integrated programs that include improved travel options, particularly affordable modes such as walking, cycling, ridesharing and public transit; positive incentives such as parking unbundling and cash out, distance-based vehicle fees; flextime and telework; and land use policies that create more accessible, multi-modal communities with affordable housing (VTPI 2008). Lower-income people often rely on alternative modes and so tend to benefit significantly from their improvement, and from better transportation and land use integration (such as more affordable housing and employment in areas easily accessed by walking, cycling and public transit).

Legitimate Criticisms of VMT Reduction Targets

Although VMT reduction targets and mobility management strategies are generally be justified and beneficial, there may be legitimate criticism of them in some situations.

Some mobility management strategies can be inefficient and unfair. For example, it would be inappropriate to arbitrarily forbid driving at certain times or locations without improving alternatives. As much as possible, mobility management strategies should reflect market principles, including consumer sovereignty, efficient pricing and neutral planning. They should improve the quality of transport and location options, favor higher value trips and more efficient modes over lower value and less travel, create more accessible land use patterns, and apply comprehensive, least-cost planning.

Mobility management programs can be uncoordinated. For example, it would be inequitable to increase user fees if alternatives (good walking and cycling conditions, convenient ridesharing and public transit service, telework options, affordable housing in accessible communities, etc.) are unavailable. Similarly, it would be inefficient to spend a lot of money on alternative modes (walking and cycling facilities, public transit service improvements, etc.) without sufficient incentives to encourage their use. Effective mobility management requires coordination among different jurisdictions and agencies.

Mobility management requires public support. For example, it would be inappropriate to tell people that they must reduce their automobile travel without communicating why and how. It will be important to communicate the consumer benefits from improved transport system efficiency, consumer savings, improved accessibility options, reduced accident risk, and improved public fitness and health.

VMT reduction targets may be nothing more than words. For example, a community may establish long-term VMT reduction targets while continuing existing transportation and land use planning practices that stimulate automobile dependency and sprawl. It is important that VMT reduction targets actually lead to positive and rational change.

Two Narratives (Litman 2009b)

This debate over VMT reduction targets reflects two conflicting narratives. Reader must decide which to believe:

VMT reduction critics claim that virtually everybody wants to lead highly mobile lifestyles and live in low-density, automobile-oriented communities, so any policy intended to reduce vehicle travel is either futile or harmful.

VMT reduction supporters believe that North America's high level of mobility is an anomaly resulting from a unique combination of rising incomes, cheap fuel and population growth, stimulated by overly-enthusiastic planning that exaggerated the benefits and ignored many costs of automobile dependency.

Conclusions

There are many reasons to reform current transportation policies. The last century was the period of automobile ascendancy during which it made sense to accommodate growing vehicle travel. The next century will require very different policies. Demographic and economic trends are increasing demand for alternative modes, and economic competitiveness will require increased efficiency. To meet these needs, transportation policies must place less emphasis on road system expansion and more emphasis on efficient management. To facilitate these changes policy makers can establish mobility management objectives to reduce vehicle travel and increased use of alternative modes. Such objectives help coordinate individual planning decisions to create a more diverse and efficient transportation system.

Criticism of these objectives tends to reflect an older planning paradigm which assumes that *transportation* means driving, and transport agencies have limited responsibilities and solutions. Critics tend to apply incomplete analysis that ignores many costs of automobile travel and many benefits of alternative modes. A new planning paradigm considers mobility a means to achieve access, recognizes that excessive mobility harms consumers and society, and expects agencies to consider a wide range of objectives, impacts and options. The new paradigm applies *systems analysis* rather than reductionist analysis that considers component individually. For example, systems analysis favors congestion reduction strategies that also help reduce parking and pollution problems, and the emission reduction strategies that also help reduce congestion.

Critics argue that mobility management and smart growth harm consumers and the economy, but such criticisms actually apply to past policies that favored automobile travel such as underpriced roads, dedicated roadway funding, excessive parking requirements, and restrictions on density and mix. Mobility management reforms correct past distortions.

Appropriate mobility management strategies reduce vehicle travel in ways that benefit consumers and support economic development. They reflect efficient market and good planning principles (consumer options, cost-based pricing, neutral policies) and so tend to increase economic efficiency and equity. Many VMT reduction critics actually support certain mobility management strategies, such as efficient road and parking pricing, more flexible zoning codes, and ridesharing incentives. In a more diverse and efficient transportation system, consumers will choose to drive less, rely more on alternative modes, and be better off overall as a result. Automobile travel will not disappear, but it will decrease compared with current planning practices. Even with relatively aggressive programs automobile travel and single-family homes would continue to be dominant travel mode and housing types.

Mobility management policies help create a transportation system that meets future needs. VMT reduction targets are the first step in implementing such policies.

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